

AREA A



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MATERIALS FOR THE CREATION OF RECORDS

Part I

Papers and Inks

By

Bernard G. Barrow, LL. B.

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I. Papers

It is often surprising to record handlers that many modern papers are in worse disrepair than ancient ones. Throughout history, materials containing cellulose have been used by man to record his thoughts. Papyrus, cloth, wood, palm leaves, and paper, among others, derive their physical strength from cellulose. Paper has replaced earlier writing materials, and with man's ever-increasing knowledge and technological sophistication, the demand for paper has likewise escalated. Unfortunately, its quality has not.

Prior to the nineteenth century papermaking was a relatively static art. The demand for greater quantities of paper brought about inventions and innovations during the 1800's, many of which adversely affected paper's lifespan.

Chronologically, the first such development was the invention of chlorine bleach in 1774. Chlorine could whiten dyed and discolored rags previously not used for papermaking. Not only was weaker cloth used, but excess chlorine was capable of weakening the fibers further.¹

The invention of the cotton gin in 1793 increased the production of cotton and introduced it as a competitor to flax (linen) which had been the principal papermaking fiber.¹

The papermaking machine (Fourdrinier) was invented early in the eighteen hundreds and was used generally by mid-century. Since shorter fibers could be used in the machine mold, weaker paper resulted.¹

The use of alum (with rosin) as sizing for paper (sizing gives wet strength so that ink will not feather) is perhaps the most deleterious of the inventions mentioned. Alum rosin size replaced gelatin/glue sizes in the United States by mid-century. Alum (aluminum sulfate) is an acidic substance and excessive use leaves an acidic residue in the paper. Unfortunately, it seems that alum was seldom measured. It is believed that alum and rosin react in such a way that sulfuric acid is liberated.¹ Some researchers feel this is the major cause of rapid deterioration in papers produced after 1850.

The invention of the groundwood process was perhaps the landmark in making economical but short-lived paper. Both cellulose and non-cellulose material from wood constitutes this paper. The non-cellulose particles produce both weakness and short lifespan. Newspapers made of groundwood discolor and become brittle quickly when exposed to light and air which initiate a breakdown of non-cellulose particles. Protected, newsprint's lifespan may be as little as 15-20 years.

The quality of book papers produced in the 19th and 20th centuries progressively degenerated as the demand for paper increased. Studies of papers produced between 1800 and 1949 indicate a formidable problem of paper deterioration, the magnitude of which has not previously been recognized or appreciated by the librarian and archivist.^{1, 2}

The book papers produced during the 19th Century and examined in these studies demonstrate a gradual transition of papers of diminishing strength. The papers produced between 1800 and 1849 consisted entirely of all rag papers and were the strongest of the papers tested for the entire century even though they were the oldest. Papers produced in the 1850's were less than half the strength of those produced in the 1840's, and the strength of the papers produced during the 1860's was half that of those produced during the 1850's. Finally, the papers of the 1870's through the 1890's were the weakest produced in that century.

Even more disturbing are the results of a study of the physical strength of book papers used from 1900 to 1949. Of all of the books examined which were produced between 1900 and 1939, 39% were very weak and could only stand limited use. Even moderate use would cause these volumes to crack and they could not be expected to last more than 25 years. Forty-nine

percent of the same group indicated that they would most likely deteriorate to the very weak category within 25 years and that their endurance would be less than newsprint. Only 1% of this group showed marked durability, the remaining 9% were found to be of medium strength which with moderate use might survive 25 to 50 years. In other words, by the end of this century, almost 90% of the book papers produced in the first forty years of the century will have deteriorated to a point at which they can only stand limited use.

In this same study, the samples examined which were produced during the period 1940 to 1949 had only aged from 7 to 17 years at the time of the study. Yet, 57% of them were already of low strength and would most likely deteriorate to limited usefulness within 25 years. Thus, the archivist has only begun to encounter the problems of preserving an aging record collection. Deterioration of records is and will be progressing at an ever increasing rate because of the last diminished strength of the papers produced during the 160 years.

With respect to presently existing records this points out the need for a conscious and planned program of restoration and preservation. Much research and development is needed to lower the cost without reducing the effectiveness of present day methods of restoration.

For future collections, this history of papermaking points out the need for the use of permanent and durable paper for the production of records. Under the auspices of the Virginia State Library and with a grant from the Council on Library Resources, Inc., William James Barrow developed a permanent and durable paper.^{2, 3} This paper, manufactured by the chemical wood process, is alkaline, has long, strong fibers, and has high tear and fold resistance. Its life expectancy is between 300 and 1,000 years. Efforts must now be made to insure that papers such as this be employed in the production of current records. Upholding the standards of permanent and durable paper, and encouraging its wide-spread use is essential.

II. Inks

Throughout history the most common writing inks were composed of carbon or iron and galls. Carbon inks contained soot, lampblack or some type of charcoal, gum arabic, and a solvent such as water. Carbon inks, however, smudged and could easily be washed from the paper.

On the other hand, iron gall inks, made from copperas (ferrous sulfate) galls, gun arabic and a solvent, were difficult to remove from paper, since they penetrated the paper fibers.

In manufacturing this ink, sulfuric acid was formed by a chemical reaction between ferrous sulfate and the organic acids of the galls. Heavy deposits of ink (particularly black ink) actually burned into the paper, in time producing holes. Occasionally papers are seen in which the acid has migrated to large writing areas producing dark brown or black discoloration. Lesser amounts of acid will discolor adjacent sheets of writing and produce reversed brown writing.⁴

Iron inks, by causing weak, brittle sheets, have increased the rapidity of paper deterioration. A study at the National Bureau of Standards by Zimmerman and Kimberly showed that the mineral acid of iron inks and copperas were detrimental to paper, but that the other ingredients were not.

Early printing inks contained a pigment (carbon black or soot for black ink) and a binder such as boiled linseed oil. The oil oxidized and polymerized forming an encrustation around the paper fibers. The black printing inks were the most permanent, and only occasionally injurious to paper.

Data from a sampling of 19th century book papers showed that about 13% of 160 papers (with 25 folds or more) lost some strength due to ingredients in printing ink. Compared to writing inks of the period however, printing ink did little damage.¹ Modern printing inks have similar qualities and are generally non-injurious.

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